SSVEO IFA List **Date:02/27/2003**

STS - 41G, OV - 99, Challenger (6) **Time:04:28:PM**

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41G-V-01	HYD
	GMT: 279:08:25		**SPR** 17F003	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Hydraulic Accumulator Pressure Drop. (ORB)

Summary: DISCUSSION: At 279:08:25 G.m.t., during prelaunch operations, hydraulic accumulator 1 pressure dropped below the launch commit criteria minimum of 1906 psia to 1632 psia. The unloader valve switched and the system was repressurized to 2150 psia by the system 1 circulation pump. After several pressure cycles over a 20-minute period that required the system 1 circulation pump to be active, the accumulator pressure stabilized at 2450 psia. The system operated normally throughout the mission.

The hydraulic accumulator 1 pressure decay experienced during prelaunch was most probably due to transient contamination in the three-way valve that precluded proper ball-valve seating. The contamination subsequently cleared and hydraulic system 1 accumulator returned to and stabilized at a normal pressure. This is similar to boot strap pressure losses experienced on previous missions. CONCLUSION: The hydraulic system 1 accumulator pressure decay during prelaunch operations was most probably caused by transient contamination in the three-way valve that subsequently cleared. CORRECTIVE_ACTION: The hydraulic system 1 three-way valve will be flown as is since the prelaunch accumulator pressure decay has not repeated. CAR ANALYSIS: Accumulator pressures returned to normal prior to launch and has operated normally since. The decision was made to fly as-is and not remove the valve. Most probable cause is believed to be transient contamination which has since passed through the valve. No further action is planned. [not included in original probelm report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41G-V-02	RCS
	GMT: 279:11:26		**SPR** 17F011	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Right Reaction Control System Yaw Thruster (R3R) Failed Off. (ORB)

Summary: DISCUSSION: At 279:11:26 G.m.t., (shortly after external tank separation), the right RCS (reaction control system) yaw thruster (R3R) failed off. Data analysis indicated that a proper firing command was issued, the fuel valve opened and the oxidizer valve did not. When thruster chamber pressure did not indicate a thruster firing in the presence of a command (after three pulses), the RCS redundancy management (RCSRM) declared the thruster failed. One successful firing of the right RCS yaw thruster was noted prior to its deselection. The thruster was left deselected for the remainder of the mission without any operational impact. A trickle current test was performed on flight day 5 and this verified the existence of a copper path to both thruster propellant valves.

A similar failure was experienced during the STS-5 mission on primary thruster F4D. Subsequent testing and failure analysis of the thruster did not find any evidence to indicate that the "failed off" condition observed during STS-5 was due to the thruster, valve or any other component of the thruster. Also, all electrical circuits including the reaction jet driver were found to be operating normally. CONCLUSION: The failure of the right RCS thruster (R3R) has been isolated to the thruster. CORRECTIVE_ACTION: The right RCS thruster (R3R) will be removed, replaced and returned to the vendor for failure analysis. The results of this investigation will be tracked by CAR 17F011. CAR ANALYSIS: Visual inspection of the ox and fuel valves revealed pitting which was theoretically caused by contaminants passing through the valve. Most probable cause for deselection was felt to be contamination blocking the pilot stage of either valve and preventing the main stage of the valve from opening. No other evidence of disfunction was observed (electrical or physical). [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41G-V-03	INS
	GMT: 279:11:07		**SPR** 17F001, 17F002	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Instrumentation Failures. (ORB)

Summary: DISCUSSION: A. The SSME (Space Shuttle Main Engine) 2 GH2 outlet pressure (V41P1260A) failed off-scale high at T+258 seconds. This measurement has failed on a number of previous flights because of the high vibration environment during launch. An improved sensor installation was implemented on both STS 41-D and STS 41-G. No failure occurred on STS 41-D. The sensor will be removed and replaced and a failure analysis will be performed and tracked on CAR 17F001.

CAR ANALYSIS: Sensor failure in this environment has become commonplace. Replacement is made routinely. No engineering changes or corrective action will be taken unless directed by NASA. [not included in original problem report] B. The SSME 1 GH2 outlet temperature (V41T1161A) failed off-scale high for approximately 3 minutes prior to MECO (main engine cut off) and recovered after MECO. Previous failures of this measurement have resulted in a redesigned sensor which is less

susceptible to the high vibration environment during launch. The sensor will be replaced with the improved design sensor and the failure will be tracked on CAR 17F002. CAR ANALYSIS: Sensor failure and replacement have become commonplace. Existing engineering is in-place to cause a one-way replacement with a -0010 unit which is capable of withstanding higher vibration levels. [not included in original problem report] C. APU (Auxiliary Power Unit) 2 bearing temperature 1 failed off-scale low prior to launch. The measurement was waived for launch because a redundant measurement was available. Post-flight troubleshooting revealed an open wire between the signal conditioner and the mulltiplexer/demultiplexer. The open connection will be repaired. CONCLUSION: See above. CORRECTIVE_ACTION: See above. EFFECTS_ON_SUBSEQUENT_MISSIONS: None pending failure analysis.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41G-V-04		OMS
	GMT: 279:12:36		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Right Orbital Maneuvering System On-board Helium Pressure Gage Failed. (GFE)

Summary: DISCUSSION: At about 279:12:36 G.m.t., the crew reported that the on-board right OMS (orbiter maneuvering system) helium pressure gage read off-scale low and that this condition had been present before launch. This gage provides crew insight for helium pressure in system 1. Helium pressures were still available on the CRT (cathode ray tube) and the downlink telemetry indications were normal. There was no impact to the mission.

Postflight troubleshooting found an open circuit in the connector between the signal conditioner and the selector switch. The connector was repaired and retested. CONCLUSION: The failure of the right OMS on-board helium pressure gage was caused by an open circuit in the connector between the signal conditioner and the selector switch. CORRECTIVE_ACTION: The connector between the signal conditioner and the selector switch was repaired and retested. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41G-V-05		TPS
	GMT:		**SPR** 17F010	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: OMS Pod Thermal Protection System Damage. (ORB)

Summary: DISCUSSION: The inflight TPS (thermal protection system) inspection showed a multi-layer FRSI (flexible reusable surface insulation) closeout strip approximately 6x40 inches at the aft edge of the tile/FRSI interface on the right-hand OMS (orbiter maneuvering system) pod was missing. Two left-hand OMS pod tiles

were also slightly damaged. Closer inspection of subsequent inflight video showed that the missing FRSI closeout strip had exposed the structural skin panels. Analysis indicated that the affected area would experience entry temperatures of approximately 700 to 750 deg F and some debonding of the exposed graphite epoxy honeycomb face sheets was probable, but no safety issue existed with the entry profile planned.

Postflight inspection confirmed that the graphite epoxy panels at and forward and aft of the missing FRSI strip had debonded and the inner face sheets had bulged inward. The area of FRSI delamination was examined in detail and it was determined the most probable cause was debonding of the pre-cast edge member which is attached to the bench-fabricated FRSI strip. This edge member was apparently not rough sanded and cleaned prior to coating with RTV (room temperature vulcanizing) material for the final bond. Without sanding and cleaning with MEK (methyl-ethyl keto), the wet RTV adhesive will not adhere to the pre-cast edge member on the FRSI strip. This lack of adhesion allowed air flow to lift the leading edge and increase the penetration to the point where the strip was peeled completely off. The area behind this 1?-inch bond line showed that the FRSI itself had not been thoroughly bonded to the face sheet. Separation would probably not have occurred if the leading edge had been properly secured. Work documents also indicated that three such strips (the missing strip and one on either side) were installed at the same time. Inspection of the other two strip revealed a small area (about 2 inches x 6 inches) across the end of one strip at the opposite end from the missing member was loose; however, there was no evidence of propagation of the debond. The other strip revealed no evidence of debond or looseness. OV-103 has a minimum of similar bond lines, all of which are located in different non-critical areas. These bonds have been flown on a previous mission, indicating that, at least for those flight loads, the bonds are adequate. They will also be inspected for evidence of improper installation or separation. There is no present acceptable method for testing the bonding of FRSI to other surfaces. However, methods are under development. Inspection of minor damage to the two left-hand OMS pod tiles showed no structural overtemperature and normal tile repair procedures will be implemented. See problem STS-41G-25 for additional tile problems. CONCLUSION: Inadequate roughening and cleaning of the pre-cast edge member of the missing FRSI strip caused it to be torn off during ascent, and entry heating caused debonding of the surrounding graphite epoxy structure. Similar bonds exist on OV-103, but all are in different non-critical areas, and these will be inspected prior to STS 51-A. No structural damage occurred to the left-hand OMS pod and normal tile repair procedures will be followed. CORRECTIVE_ACTION: The right-hand OMS pod will be repaired. The OV-104 OMS pod will be installed on OV-099 to support the next flight of that vehicle. The installation procedure and the specification are being changed to require sanding and cleaning the pre-cast edge members for all future applications. Design studies are underway to develop changes which would prevent structural damage to the pod in the event of TPS failure. Failure analysis will be tracked on CAR 17F010. EFFECTS_ON_SUBSEQUENT_MISSIONS: None pending results of CAR analysis.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41G-V-06	C&T - Ku-band
	GMT: 279:23:54		**SPR** 17F005, 17F007	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Ku-Band Antenna Alpha And Beta Gimbal Control Was Lost. (ORB)

Summary: DISCUSSION: At about 279:23:54 G.m.t., the Ku-Band antenna experienced oscillations of the alpha gimbal and control of the beta gimbal was lost. The crew switched from COMM to STANDBY and this temporarily stopped the alpha-axis oscillations. The crew then removed electrical plug P377 from EA1 (electronics assembly 1) to disable the gimbal drive, and thereafter, the gimbals only moved in response to an external force such as OMS (orbital maneuvering system) burns. This movement was slight, and Ku-band communications were maintained through TDRSS (tracking data relay satellite system) using the Orbiter TDRSS track attitude procedure.

During the EVA (extravehicular activity), the Ku-Band deployed assembly was rotated to the STOW position by using the DIRECT STOW switches. The EVA crewmen then positioned the antenna to the lock position which enabled the cabin crewmen to lock the pins by applying 28 Vdc to pins E and F of plug P377. The antenna was the re-deployed and thereafter HDR (high data rate) and TV transmissions were continued through TDRSS. There was no problem when stowing the antenna for entry. Postflight troubleshooting revealed that the beta drive transistors in EA1 had failed. In addition, when the antenna was positioned near the minus beta and minus alpha mechanical stops, a short to vehicle ground existed in the DA (deployed assembly) beta drive motor armature winding. The short was not present when the antenna was positioned away from the mechanical stops. This short would cause the failure of the transistors in EA1 and thus the loss of beta gimbal control. This condition, in turn, would cause the antenna oscillations due to a negative gain margin in the alpha servo loop. The alpha servo loop gain is a function of the beta angle. Troubleshooting at the vendor showed that one of three screws had come loose in the brush block assembly of the beta drive motor. One end of the screw had black marks indicating arcing. The beta gimbal brush block screws will be replaced with self locking screws on the DA's of OV-103 and OV-099 prior to flight. The clearance between the alpha brush block assembly mounting screw heads and the gimbal structure is such that the screws would be held captive should they loosen. These screws, however, will be replaced with self locking screws when the DA's can be returned to the vendor for modification. The failed DA and EA 1 were removed, replaced and returned to the vendor for failure analysis. CONCLUSION: A screw came loose from the brush block assembly in the beta drive motor and shorted the motor drive to ground, precipitating the failure of the beta-drive transistors in EA1. CORRECTIVE_ACTION: The DA and EA1 were removed, replaced and returned to the vendor for failure analysis. The results of this activity will be tracked via CAR 17F005. The beta gimbal brush block screws will be replaced with self locking screws on the deployed assemblies of OV-103 and 099 prior to flight. The alpha gimbal brush block screws will be replaced with self locking screws when the DA's can be returned to the vendor for modification. Resolution: CLOSED CAR17F005 11/06/84 EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41G-V-07		APU
	GMT: 280:00:45		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Auxiliary Power Unit 2 Pump Drain Line Heater A Failed (V46T0286). (ORB)

Summary: DISCUSSION: The APU (auxiliary power unit) 2 pump drain line heater A failed at 280:00:45 G.m.t. The system B heater was selected and the temperatures were maintained throughout the remainder of the mission.

Troubleshooting at KSC determined that the failure was caused by a failed thermostat. In the process of troubleshooting, it was also discovered that heater S-122 was nicked. CONCLUSION: The heater failure was caused by a failed thermostat. CORRECTIVE_ACTION: The thermostat and heater are to be replaced. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41G-V-08		Windows
	GMT: 279:12:41		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Aft Flight Deck Port Window (W10) Had Ice-like Particles Between Panes, And Forward Windows (W1 And 4) Were Chipped. (ORB)

Summary: DISCUSSION: The crew reported that the aft flight deck port window (W10) had ice-like particles between the panes. The particles were observed during the STS 41-C and the STS 41-G missions, the STS 41-G postflight inspection and, in on-orbit pictures taken by the STS 41-G crew. Similar particles are starting to develop on the window W10 on OV-103. Postflight inspection also shows that the outer panes of the windows W1 and W4 on OV-099 were chipped.

The gaseous nitrogen purge on W10 was verified and the dessicant for the window did not show excessive moisture, thus leading to the conlcusion that this phenomen is some other element that was deposited on the window pane, or coating separation. Window inspection shows that the contamination appears to be limited to the inside of the outer pane. Since access to the space between the window panes can only be obtained by window removal, no further action will be taken during the STS 51-C flow. This phenomenon has also been observed to a lesser degree on OV-103. The W1 and W4 windows chips were probably caused by launch debris or meteoric impacts. The two forward windows are being replaced. CONCLUSION: Particles on the W10 window could be caused by contamination or coating separation. The chips on windows W1 and W4 were probably caused by launch debris or meteoric impacts. CORRECTIVE_ACTION: The W10 window will be replaced at the earliest schedule opportunity and an analysis performed on the window at that time. The W1 and W4 windows are being replaced. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation	Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41G-V-09	ECLSS

GMT: 281:14:50 **SPR** 17F004 **UA** **Manager:**

IPR **PR**

Engineer:

Title: Flash Evaporator System Shutdown Using Both Controllers. (ORB)

Summary: DISCUSSION: At 281:14:50 G.m.t., the topping FES (flash evaporator system) experienced an automatic shutdown. Repeated attempts to restart the primary "A" controller were unsuccessful. A similar result occurred after switching to primary "B" controller. Data analysis indicated that the flash evaporator nozzle was possibly iced or frozen up. The radiator outlet temperature set point was left in high (57 deg F) during the following crew sleep period to put additional heat into the flash evaporator core area and thereby melt/sublimate what was thought to be an icing condition.

At 282:18:33 G.m.t., a FES restart was initiated using the primary "B" controller. The FES operated normally for 6 minutes before an automatic under-temperature shutdown occurred. The topping steam duct temperatures dropped indicating the movement of ice down and out of the ducts. An under-temperature shutdown would be anticipated under this condition. The radiator outlet temperature set point was again left in high to provide higher temperatures into the flash evaporator system. In addition, the FES shutdown required the initiation of potable water dumps to manage the potable water quantity. The potable water dumps were performed successfully using established dump procedures while viewing the dump nozzle with the RMS (remote manipulator system) wrist TV camera. At 283:10:51 G.m.t., the FES was restarted using primary "B" controller. This activation was successful and the FES continued to operate normally for the remainder of the mission. Soon after the FES was activated, the radiator control temperature set point was changed to normal (38 deg F). The cabin and payload coolant loop temperatures began to decrease with the payload loop stabilizing at about 44 deg F and the cabin at 77 deg F. Postflight testing verified that both primary "A" and "B" controllers are operating normally. The flash evaporator system A valve package, which consists of the pulsing valve, isolating valve, and spray nozzle, has been removed and returned to the vendor for testing and analysis. The valve package was tested at the vendor facilities. The pulsing valve did no leak. The nozzle spray pattern was tested and it matched the acceptance test data. A spare valve package has been installed and checked. The FES is considered functionally ready to support the next scheduled mission. CONCLUSION: The FES automatic shutdown was caused by formation of ice at the spray nozzle which blocked the nozzle spray pattern as demonstrated by the slow response on the immediate start-up attempts. The build-up of ice near the spray nozzle was most probably caused by transient contamination which allowed the pulsing valve to leak, forming ice at the spray nozzle. Postflight, the failure mode could not be duplicated by ground leak testing of the pulsing valve implying that the contamination condition had cleared. CORRECTIVE_ACTION: The FES valve package has been removed and replaced. The testing and failure analysis of the removed valve package will be tracked by CAR 17F004. If icing resumes in the evaporator, the same ice clearing procedure can be used as performed on STS 41-G. CAR ANALYSIS: Unable to duplicate failure post-flight. Most likely cause of shut-down was hydrogen gas in the water system. Crew procedures have been revised to include a new FES start-up procedure. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-41G-V-10	DPS
	GMT: 285:22:20		SPR 17F008	UA	Manager:
			IPR	PR	
					Engineer:

Title: Display Electronics Unit 2 Failed. (ORB)

Summary: DISCUSSION: At approximately 285:22:20 G.m.t., the crew reported that CRT (cathode ray tube) 2 went blank with an "I/o error CRT 2" message and a DEU (display electronics unit) 2 bite flag tripped. Analysis of downlink data indicated that a transient hardware failure caused a software upset in the DEU. The DEU's software was reloaded and CRT 2 was recovered. The display failed again in approximately 1 hour. A cable exchange was performed to use DEU 4 to drive CRT 2. No further problem was encountered with CRT 2 for the remainder of the mission. The unit has been removed and returned to the vendor for detailed failure analysis. The problem was duplicated at the vendor and has been isolated to a hardware failure on a specific memory page in the DEU.

CONCLUSION: The CRT went blank due to a transient hardware failure on a specific memory page in the DEU. This caused a DEU software upset. CORRECTIVE_ACTION: The DEU has been removed and replaced. The vendor will perform a detailed analysis under CAR 17F008. CAR ANALYSIS: The flight failure was isolated to the SMCM page of the DEU. The page was replaced and the DEU was returned to service. The SMCM page was then subjected to exhaustive testing and the failure would not repeat. Two potentiometers were replaced as the most probable cause. The SMCM page has been relegated to non-flight status. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: None, pending results of the failure analysis.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-41G-V-11	DPS
	GMT: 285:22:20		SPR 17F009	UA	Manager:
			IPR	PR	
					Engineer:

Title: Right Keyboard Control Of Display Unit 3 Was Lost. (ORB)

Summary: DISCUSSION: At approximately 285:22:20 G.m.t., the crew reported an interface problem between the right keyboard and DU (display unit) 3. When DU 3 was turned on after the failure of DEU (display electronics unit) 2, the keyboard was unable to drive keys on the left column. Control was re-established temporarily by cycling power on DU 3. The right keyboard was able to control DU 3 the following day, but intermittent control losses continued to occur throughout the rest of the mission. However, control of DU 3 from the left keyboard was never lost.

Troubleshooting at KSC (Kennedy Space Center) did not duplicate the probelm. The DEU 3 has been removed and returned to the vendor for detailed failure analysis. Test of the DEU stand-alone at the vendor also did not duplicate the problem. The keyboard is being removed and returned to the vendor so that an integrated test can be performed to isolate the problem. CONCLUSION: The interface between the right keyboard and DU 3 was intermittent. CORRECTIVE_ACTION: The DEU has been removed and replaced. The vendor will perform a detailed analysis under CAR 17F009. The keyboard is also being removed and returned to the vendor for test with the DEU. CAR ANALYSIS: Problem was isolated to a defective key. This KBU failure will be tracked and closed on CAR 17F019. A new key switch has been designed and is being installed in all KBU's returned for refurbishment. CAR 17F019 is closed. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: None, pending results of the failure analysis.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41G-V-12	D&C
	GMT: 286:11:38		**SPR** 17F014	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Mission Events Timer On Panel O3 Lost One Horizontal Segment On Left Digit. (ORB)

Summary: DISCUSSION: At about 286:11:38 G.m.t., the crew reported that the MET (mission events timer) malfunction light on panel O3 indicated red. This was caused by the loss of one horizontal segment on the left digit. There was no impact to the mission.

Previous loss of indicator segments have been caused by failed filaments. The MET will be removed, replaced, and returned to the vendor for failure analysis. CONCLUSION: The loss of the MET horizontal segment was most probably caused by a failed or open filament. CORRECTIVE_ACTION: The MET will be removed, replaced, and returned to the vendor for failure analysis. The results of this activity will be tracked via CAR 17F014. CAR ANALYSIS: Failure analysis indicated that the failure was caused by a loose break-off tang from a helicoil insert which created a short on the power circuit to the "A" segment of the failed digit. The manufacturer has inspected all assemblies and subassemblies in stock to assure that the break-off tang is not attached to any of the associated helicoil inserts. No further action is deemed necessary. This CAR is closed. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41G-V-13	STR
	GMT: 286:11:38		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Two Brackets Attached To Galley For Privacy Curtain Debonded And Galley Bottom Door Did Not Lock In Open Position. (ORB)

Summary: DISCUSSION: The crew reported at 286:11:38 G.m.t., that the brackets attached to the galley for the privacy curtain had debonded. On STS 41-C, the previous flight of OV-099, a privacy curtain bracket had debonded from the bulkhead. The crew used Velcro to secure the privacy curtain and there was no mission impact. The debonding failures were caused when members of the crew collided with the galley brackets during on orbit operations.

At the postflight technical crew debriefing, the crew reported that the galley bottom door did not stay locked in the open position during meal preparation. CONCLUSION: Members of the crew collided with the galley brackets during on-orbit operations and caused the debonding failures. The reason for the failure of the galley bottom door to lock in the open position is unknown at this time. CORRECTIVE_ACTION: The brackets for the privacy curtain have been rebonded to the galley using standard procedures. Operation of the locking detent to hold the bottom galley door in the opne position for meal preparation will be reviewed with the crew. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR** JSC-EE-0592	**IFA** STS-41G-V-14	C&T
	GMT: 279:16:09		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: The Color TV Camera On The Remote Manipulator System Elbow Lost Color Wheel Synchronization. (GFE)

Summary: DISCUSSION: The color synchronization on the RMS (remote manipulator system) elbow TV camera was lost at 279:16:09 G.m.t., and again at 284:20:06 G.m.t. On the first occurrence, synchronization was recovered by recycling power on the camera. Ground monitoring of the camera was limited and the crew can not detect the problem because no onboard color monitor is available so the duration of the synchronization loss could not be verified. The camera video was usable in black and white thorughout the mission. The camera has been removed and returned to the vendor for detailed analysis.

CONCLUSION: The color syschronization system for the camera failed. CORRECTIVE_ACTION: The camera has been removed and replaced. The vendor will perform a detailed failure analysis under FIAR JSC-EE-0592. FIAR ANALYSIS: Unable to duplicate problem post-flight. Suspected television is GFE to the Orbiter. Post-flight attempts to duplicate the reported anomaly are documented in the NASA failure reporting system under FIAR RCATVB0802. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: None, pending results of FIAR JSC-EE-0592.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41G-V-15	RCS

GMT: 284:09:03	**SPR** 17F012	**UA**	**Manager:**
	IPR	**PR**	
			Engineer:

Title: Left Reaction Control Subsystem Fuel Primary Helium Regulator B Internal Leak. (ORB)

Summary: DISCUSSION: The left RCS (reaction control subsystem) fuel primary helium regulator B exhibited an internal leak by a rise of 4 psi over a 8-hour period in the left RCS fuel propellant tank ullage pressure. The primary B regulator leak rate was approximately 7000 scch versus a specification value of 150 scch. This internal regulator leakage presented no impact to the mission.

The left RCS fuel primary and secondary B leg regulators will be leak checked during ground turnaround operations. The most probable cause of the left RCS fuel primary regulator leakage was a small-sized particulate contamination which affected the poppet seals. Redundancy in the helium system pressure regulation exists from regulators (primary and secondary) in series in each of two selectable parallel paths (leg A or B). CONCLUSION: The left RCS fuel primary helium regulator B exhibited a slow internal leak which most likely was caused by contamination. CORRECTIVE_ACTION: The left RCS primary and secondary B leg regulators will be leak checked during ground turnaround operations. Verification of the internal regulator leak will result in a removal and replacement of the regulator at the first opportunity. The results of any further testing and/or investigation will be tracked by CAR 17F012. CAR ANALYSIS: Based on the fact that three other fuel helium regulators of this pod have been replaced for leakage caused by contamination, it is suspected that the same is true of this regulator. During post-flight testing this regulator operated in-spec and is determined to be flightworthy. No further corrective action is planned. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	**Time**	**Classification**	**Documentation**		**Subsystem**
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41G-V-16	OMS
	GMT: 282:02:57		**SPR** 17F016	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Right Orbital Maneuvering System Oxidizer Drain Line Temperature Erratic. (ORB)

Summary: DISCUSSION: At about 282:02:57 G.m.t., a S89 PRPLT THERM alarm was annunciated. The cause of the alarm was the right OMS (orbital maneuvering system) oxidizer drain line temperature (V43T6237A). A heater cycle had occurred at that time and the drain line temperature went from 87 deg F to 112 deg F, breaking the upper limit of 110 deg F. The FDA (fault detection annunciator) limit was raised to 125 deg F to prevent further alarms during the crew sleep period. In addition, the heaters were switched from system B to system A. The V43T6237A sensor is located closer to the B heater element than to the A heater element and typically indicates about a 25 deg F higher temperature peak when the system "B" heaters are used. However, the temperature data indicated a large number of thermal peaks when the

system B heater was being used. The system B heater control thermostat is suspect and will be removed, replaced, and returned to the vendor for failure analysis.

CONCLUSION: The FDA alarm was caused by temperature spiking when using the system B heaters. The most probable cause is a faulty heater control thermostat. CORRECTIVE_ACTION: The system B heater control thermostat will be removed, replaced, and returned to the vendor for failure analysis. The results of this activity will be tracked via CAR 17F016. CAR ANALYSIS: The analysis did not disclose a switch problem. The switch was not mounted properly (loose). No other anomalies of this nature have been recorded. This CAR is closed. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-41G-V-17	MECH
	GMT: Postlanding		**SPR** 17F006	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Three Of Four Brakes Damaged. (ORB)

Summary: DISCUSSION: Postflight inspection, removal, and disassembly of the brakes revealed that three of the four brakes experienced damage. The beryllium was cracked on rotor 4 of the left inboard and both the right inboard and outboard brakes. Rotor 3 of the right outboard brake also had crackes in the beryllium. All three brakes had chipped carbon edges, scored linings, missing TZM washers and bent drive clips. Damage was very similar to that which occurred on STS-7 and STS 41-C with OV-099.

Analysis of the 49 channels of brake instrumentation added to OV-099 for STS 41-G is expected to characterize the brake/hydraulic dynamic interaction. Data analysis is continuing to better understand the problem and to identify possible fixes to eliminate brake damage. CONCLUSION: Three of the four brakes were damaged during braking. The brake damage is not considered a safety issue. Hard braking was demonstrated on STS-6 (OV-099) as a development flight test objective. CORRECTIVE_ACTION: Data analysis is continuing to better understand the cause of the high dynamic loading during braking and to identify possible fixes to eliminate brake damage. CAR ANALYSIS: Some degree of brake damage occurs with nearly every mission. Several approaches have been put forward to redesign the brakes but only minor changes to the existing design have been approved. Damage to brakes does not represent a flight failure. Until proven corrective action is taken, the brakes will be new, or refurbished to like new condition, incorporating all design changes approved to date and utilizing all new inspection criteria. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-41G-V-18	MECH

GMT: Postlanding	**SPR**	**UA**	**Manager:**	
	IPR	**PR**		
			Engineer:	

Title: All Four Tires On The Main Landing Gear Had A Flat Spot And The Second Tread Rib On The Right Inboard Tire Was Worn To The Cord In Spots Around The Tire. (ORB)

Summary: DISCUSSION: Each of the four MLG (main landing gear) tires had a tear-drop shaped flat spot centered in the middle of the tire between the third and fourth tread ribs. The second tread rib of the right inboard tire was worn through one to two layers of cord in spots around the tire.

CONCLUSION: The flat spot on each of the four MLG tires was caused by tire spinup. The tread wear on the second tread rib of the right inboard tire was probably due to high dynamic loading during braking. Tire wear is not a safety issue. CORRECTIVE_ACTION: All four MLG tires have been removed from service and replaced. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	**Time**	**Classification**		**Documentation**		**Subsystem**
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41G-V-19		RMS
	GMT: 285:14:15		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Remote Manipulator System Wrist Roll Encoder Check Alarm Occurred During Power Up And Four Warning Lights Popped Out During Ascent. (RMS)

Summary: DISCUSSION: During RMS (remote manipulator system) power-up for flight day 5 activities, encoder check alarms were generated for the shoulder-pitch and wrist-roll joints. The shoulder-pitch encoder alarm is likely during power-up because of the large encoder offset bias for the joint (3.85 degrees). The wrist-roll joint alarm should not have been issued due to the small joint offset bias (0.22 degrees) and the joint position at power-up. A thorough review of the downlisted data at that time did not reveal any anomalies, but due to the downlisted encoder sample rate, any transient conditions would probably not be seen. It is unlikely that this condition could be repeated during ground turnaround as this condition exists only during power-up at low arm temperatures. The arm worked without an anomaly for the rest of the flight.

During the postflight crew debriefing for STS 41-G, the crew reported that the lens of four warning lights on panel ABA1 popped partially out during ascent. The crew reinstalled three of the lights, but the "check CRT" light could not be reinstalled and therefore, was inoperative. When the power-up problem occurred, the inoperative light did not alert the crew to check the CRT (cathode ray tube). Alarms during the RMS power-up sequence are expected due to the arm configuration, and without the "check CRT" light the crew continued successfully with the arm power-up sequence. CONCLUSION: The cause of the wrist-roll encoder check alarm is unknown. The RMS performed flawlessly throughout the remainder of the mission. Normal turnaround testing will verify the RMS readiness to support the next OV-099 flight. The lenses on

the warning lights were most probably not properly seated when they were installed. CORRECTIVE_ACTION: No special testing is required at KSC (Kennedy Space Center) since it is extremely unlikely that the encoder check alarm could be repeated during ground test. The panel lights will be inspected and repaired or replaced as required and their operation will be verified prior to the normal RMS turnaround tests. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-41G-V-20	EPD
	GMT:		SPR 17F013	UA	Manager:
			IPR	PR	
					Engineer:

Title: Payload Specialist Station Floodlight Failed. (ORB)

Summary: DISCUSSION: During the crew technical debriefing, it was reported that the payload specialist station floodlight had failed on flight day 4.

Postflight troubleshooting revealed that there was no output voltage to the dimming control potentiometer on panel L9. Also, the input power circuit breaker would trip 40 to 45 seconds after actuation. This indicates that an excessive load had developed within the switch control or dimming control electronics that are a part of the floodlight assembly. The floodlight assembly will be removed, replaced, and returned to the vendor for failure analysis. CONCLUSION: The floodlight assembly failure was most probably caused by a component failure in either the switch control or dimming control electronics. CORRECTIVE_ACTION: The floodlight assembly will be removed, replaced and returned to the vendor for failure analysis. The results of this activity will be tracked via CAR 17F013. CAR ANALYSIS: The analysis disclosed that a faulty transformer caused the failure. This is the only recorded failure of this transformer. No further action required. This CAR is closed. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET:	Problem	FIAR ILC-H-0700F	IFA STS-41G-V-22	INS
	GMT:		SPR 09F025	UA	Manager:
			IPR	PR	
					Engineer:

Title: Crew Interface Equipment Problems. (GFE)

Summary: DISCUSSION: A. The volume "G" door opened at launch, the volue "E" door had to be pried open on orbit, and the waste compartment door would not close on orbit. A similar problem occurred on previous OV-099 flights and a corrective design has been released by MCR 10742.

B. The EVA (extravehicular activity) flashlight failed. The bulb came unscrewed and was loose inside the light. The bulb was screwed back in place, epoxy was added to retain the bulb for STS 51-A, and the light was retested. The bulb retention will be redesigned for subsequent missions. C. The EVA operational slide wire cushion strap was difficult to secure. The EV-1 crewman had difficulty using one hand to depress the cushion, attach the strap in place and secure the two tether hooks and steel guides on the slide wire for entry. Operation of the slide wire cushion strap will be reviewed with the EVA crewmen. D. EVA slide-wire safety tether tension was too high. Both EV-1 and -2 locked the take up reels during part of the EVA when the tether tended to pull them away from their workstations. A similar problem occurred on previous EVA's and reduced tension in the tether is being proposed for implementation on STS 51-D and subsequent missions. E. Outer hatch equalization valve cover came loose. The EV-1crewman retrieved the cover from the payload bay. The crewman snapped the tether back onto the cover prior to entry. The cover was probably knocked off the tether during crew egress or ingress for EVA. Tether design is being evaluated to improve retention capability. CONCLUSION: See above. CORRECTIVE_ACTION: See above. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-41G-V-23		MPS
	GMT:		SPR	UA		Manager:
			IPR	PR		
						Engineer:

Title: Main Propulsion System Pneumatic Pressure Decayed During Ascent. (ORB)

Summary: DISCUSSION: The MPS (main propulsion system) pneumatic pressure decayed from 4200 psi to 3800 psi during the time interval of T-10 seconds to MECO. During this period, the gas in this tank was used to hold MPS valves in a fixed position and the leakage should have been essentially zero. After MECO, this helium tank was connected with the other MPS helium tanks to perform the on-orbit MPS system dump and then the tank isolation valve was closed until the pre-entry helium purge sequence was performed.

Both the MPS dump and the pre-entry purge were performed successfully and no leakage was evident during the MPS dump or during the on-orbit period with the pneumatic system isolation valve closed. This problem was experienced on STS-7 (see STS 7-36) and the most probable cause was determined to be minor contamination in a pneumatic valve which cleared during the MPS dump sequence. CONCLUSION: The MPS pneumatic system pressure drop during ascent was most probably due to minor contamination in a pneumatically operated valve which cleared during on-orbit dump or purge operations. CORRECTIVE_ACTION: Normal turnaround leak test procedures will determine that specified leak conditions are not exceeded. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	MET: Prelaunch	Problem	FIAR HEN0047F	IFA STS-41G-V-24	PYLD
	GMT: Prelaunch		SPR	UA	Manager:

IPR **PR**

Engineer:

Title: Aerodynamic Coefficient Instrumentation Package (ACIP) Failed Prelaunch. (GFE)

Summary: DISCUSSION: At approximately T-17 minutes when the ACIP (aerodynamic coefficient instrumentation package) system was turned on, the ACIP science data was present in the PCM bit stream for 4 seconds, then all ACIP science data values read off-scale high. The ACIP housekeeping data continued to read valid throughout the ACIP operating periods. However, at the time of the science data failure the 5-volt power supply parameter in the housekeeping data read near zero indicating an interruption in the 5-volt power supplied to the ACIP science data encoder. This loss would explain the off-scale high reading of all ACIP science data.

The ACIP package, the mini-DHE (data handling electronics), the PCM (pulse code modulation) master unit, and the PCM slave unit on OV-099 have been removed and will be replaced with like electronics from OV-102. The removed units will be returned to JSC for failure analysis. CONCLUSION: A failure in the ACIP science data encoder power supply most probably caused the loss of the ACIP science data for this mission. CORRECTIVE_ACTION: The ACIP data system components have been removed from OV-099 and will be replaced with OV-102 components. Failure analysis will be tracked on FIAR HEN0047F.
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-41G-V-25	TPS
	GMT:		**SPR** 17F015	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Missing Wing Chine Tile And Faulty Tile Screed Area. (ORB)

Summary: DISCUSSION: Tile inspection after STS 41-G showed an extensive area of tile screed material on OV-099 was degraded. The degradation was identified as a time-and temperature-related phenomenon resulting from chemical reactions of the TPS materials including the waterproofing agent. The OV-103 vehicle was cleared for STS 51-A based on selective tile-bond sampling (and the fact that the vehicle had only one flight with preflight waterproofing cycle).

Testing and analysis show the bond degradation is the result of a chemical reaction between the 6079 waterproofing material and the RTV 577 screed material in the presence of water, and this results in a permanent alteration of the bonding properties when the 6079 is applied to the tile after it is bonded to the vehicle. The factory application of the 6070 waterproofing prior to initial tile boding to the vehicle is not detrimental because the chemical reaction causing the weakening of the bond is dissipated in the tile curing process. CONCLUSION: Tile-bond degradation necessitated the replacement of all "tile-over-screed" on OV-099. The use of 6079 as the primary waterproofing agent after tile are bonded to the vehicle will be discontinued.The vehicle has been restored to its factory-built condition for STS 51-E. For close-in

follow-on flights, Scotchguard waterproofing will be utilized until a compatible waterproofing agent can be developed. CORRECTIVE_ACTION: Over 4000 "tile-over-screed" have been replaced with factory-waterproofed tile. Inspection of blanket-over-screed portions of the vehicle has verified the bonding integrity. An ongoing effort is underway to develop a waterproofing agent which is compatible with tile-bonding materials. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE